presse villosulo-tomentosa, demum ut videtur paullo glabrescentia, sordide viridescentia, costa nervisque paullo impressis, subtus dense albescenti- vel flavescenti-tomentosa, costa nervisque lateralibus utrinque 6–9 elevatis tomentosis et etiam (matura probabiliter distinctius) reticulata; petioli vix ultra 2 mm. longi, dense tomentosi; stipulae nullae vel minimae punctiformes. Amenta coetanea (an semper?), pedunculis brevibus minime vel distinctius foliolatis suffulta; mascula ad 2.5:0.7 cm. magna, pedunculo ad 5 mm. longo excluso; bracteae oblongae, obtusae, brunnescentes (an in vivo roseae?), utrinque satis dense sericeae (pilis plerisque bractea breviori-bus); stamina 2, filamentis liberis glabris bracteam dein ad fere 2-plo superantibus, antheris minimis crasse ellipsoideis vix ultra 0.6 mm. longis ut videtur violaceis; glandula 1, ventralis, anguste conica, truncata, bractea 2-plo brevior; feminea subpraecocia, sub anthesi ad 2.5:0.6 cm., fructifera ad 5:1 cm. magna pedunculo 2–8 mm. longo excluso; bracteae ut in flore masculo vel magis obovatae; ovaria ovoidea, dense breviter villosulo-tomentosa, sessilia; styli circiter 1 mm. longi, integri vel subbifidi, stigmatibus brevibus bifidis stylo circiter $2\frac{1}{2}$-plo brevioribus; glandula 1 ut in flore masculo; fructus ellipsoideo-conici, circ. 5.5 mm. longi, ut ovaria pilosi.

TYPE LOCALITY: Gasquets, Del Norte County, California.

SPECIMENS EXAMINED: CALIFORNIA. Del Norte County: Waldo-Crescent City Road, Gasquets, April 23, 1907, *A. Eastwood* (No. 52, fr. submat.; Cal.; type!); Rock Creek, April 29, 1907, *A. Eastwood* (No. 177, f.; Cal.); Smith River near Adams, May 4, 1907, *A. Eastwood* (No. 233, m. paratype; Cal.).

At first, I was inclined to regard this plant as only a broad-leaved variety of *S. Breweri*, but the shape of the gland in the male and female flowers is different in the two. In *S. Breweri* the gland is narrower and often almost filiform, especially in the female flowers in which it is half the length of the young ovary. In *S. delnortensis* the gland is also narrow but shorter and never filiform. The anthers seem to be always yellow in *S. Breweri* and violet in the new species, but, of course, a careful observation is needed of more copious material with mature leaves and a study of the plants in the field to fix the specific value of *S. delnortensis*. It apparently also grows in a semiarid region; and Miss Eastwood collected another peculiar willow near Gasquets, which too seems to represent a new species the relation of which, however, is with *S. Scouleriana* notwithstanding a certain similarity to *S. delnortensis* in its external appearance. I shall deal with it when I speak of *S. Scouleriana* in a later note.

THE BONIN ISLANDS AND THEIR LIGNEOUS VEGETATION

E. H. WILSON

SOME 520 miles almost due south of Tokyo, Japan, is a group of small islands known to the western world as the Bonin Islands and to the Japanese as Ogasawara-shima. These islands are governed by the Tokyo prefect, and communication is maintained by a monthly steamer plying from Yokohama. They lie between the parallels of Lat. 27° 5 m. and 26° 30 m. N.,

with the chief port, Omura, — Port Lloyd of our maps — in Lat. 27° 4.35 m. and Long. 142° 11.3 m. E., and are divided into three groups, the central being the largest and most important. The northern, the Parry group of our maps, is called Mukō-jima (Son-in-law Islands) by the Japanese, and consists of four tiny islands having a total area of 1096 acres and a population of 40. The central group, Chichi-jima (Father Islands) of the Japanese, consists of eight islands of a total area of 9472 acres and a population of 2230. Five of these islands are uninhabited. The three largest on our maps are called Peel, Buckland, and Stapleton Islands. The first named is the Chichi-jima proper of the Japanese; it is the principal one of the group being 5932 acres in extent with a population of 2140, and boasts the only safe anchorage in the Bonin Islands. The southern group, known as Haha-jima (Mother Islands), the Bailey or Coffin group of the western maps, consists of nine islands having a total area of 6219 acres and a population of 2030. Haha-jima proper (the Hillsboro Island of our maps) is itself 5121 acres in extent and has 2000 persons living on it. Five of the others are uninhabited.

The islands are steep and hilly and six of them are merely bare rocks less than 100 ft. high. The highest point is Chibusa-yama (Nipple Mt.) on Haha-jima which is 1527 ft. above sea-level. The highest point on Chichi-jima is Chuo-yama, 1060 ft. high and on Mukō-jima, Oyama only 295 ft. above the sea. The coast line of all is steep, and is much indented, and the tide-rips between the islands are very dangerous. Storms accompanied by high winds are frequent. Except at the port of Omura (Port Lloyd), embarking and disembarking is far from easy even in calm weather and the landing of cargo can only be done at such times.

The history of the Bonin Islands, little as it is, is of more than ordinary interest. Their very ownership was not definitely settled until November, 1875, when they passed into the possession of Japan. From Japanese records it appears that these islands were known to Japan in A.D. 1593 if not before, when they were held as a fief by the Daimio Ogasawara Sadayori and communication was maintained with them up to 1624. According to Kaempfer (*Hist. Jap.* I. 60, [1729]) about the year 1675 the "Japanese accidentally discovered a very large island, one of their barks having been forced there in a storm from the island Hachijo, from which they computed it to be 300 miles distant toward the east. They met with no inhabitants, but found it to be a very pleasant and fruitful country, well supplied with fresh water and furnished with plenty of plants and trees, particularly the Arrack tree, which, however, might give room to conjecture that the island lay rather to the south of Japan than to the east, these trees growing only in hot countries. They called it Bune-sima or the Island Bune, and because they found no inhabitants upon it they marked it with the character of an uninhabited island. On the shores they found an incredible quantity of fish and crabs, some of which were from four to six feet long." This description fits the islands exactly if Kaempfer's conjectures be accepted as to the locality being south and not east, and the crabs as turtles, which for-

merly were very abundant there. In both these errors the Japanese sailors might, under the circumstances, be readily excused. In 1728 a descendant of Ogasawara Sadayori temporarily established communication with the islands again but after this the Japanese took no further interest in them until 1861. It appears, however, from the researches of the late Archdeacon King in the libraries of the British Museum and the Royal Geographical Society that credit belongs to the Spaniard, Ruy Lopez de Villalobos, commanding an exploring expedition that sailed from Mexico sometime in 1543. After reaching the Philippines on August 26, 1543, he sent off a small ship, the "San Juan," to explore in a northerly direction. Sometime about the middle of October this ship sighted some islands which from the description the crew afterwards gave were almost certainly some of the Bonin group. Apparently no landing was effected but that this ship first discovered the group may be confidently accepted, and that some fifty years before the earliest Japanese claim.

On some old charts a group of islands, under the name of Arzobispo Islands, is marked roughly where the Bonins lie and some have considered them identical. The Marianos and Ladrones groups, known to navigators early in the sixteenth century, are not so very far south of the Bonins, and these same sailors might well have visited both groups. Be this as it may, in 1823 an American whaling ship, the "Transit," commanded by Captain Coffin touched at the southern group (Haha-jima). In 1825, the "Supply" an English whaler, visited Port Lloyd (Omura, Chichi-jima) and left a record of her visit by nailing a board to a tree. This board was found by Captain Beechey of the English war-ship "Blossom" which anchored there on June 9, 1827, and found living on the island two castaways from the English whaling ship "William," wrecked there in November, 1826. Captain Beechey stayed until June 15, and a full account of the visit is given in his *Voyage to the Pacific*, II. Chapter 6, pp. 227–240 (1831). During the stay a number of plants were collected and are enumerated with those from Liukiu in Hooker and Arnott's *Botany of Captain Beechey's Voyage*, 258–275. This is the first record of plants being collected on the islands whose very position was not properly charted until this visit. Before leaving a sheet of copper nailed to a board was affixed to a tree and on this the following words were punctured: "H. M. S. 'Blossom,' Captain Beechey, R. N., took possession of this group of islands in the name and on behalf of His Majesty King George, the 14th of June, 1827."

In May of the following year (1828) Captain Lütke, Commander of the Russian corvette "Senjawin" arrived at the Bonins and annexed them in the name of Russia. On board was F. H. von Kittlitz who was evidently no mean artist. His sketches and notes were first published in 1844 in German. In 1861 Berthold Seemann translated and edited them under the title of "*Twenty-four Views of the Vegetation of the Coasts and Islands of the Pacific.*" Plates XIV, XV, XVI give views of the vegetation of the Bonin Islands and are accompanied by delightfully written descriptive notes.

In May 1830, an American seaman, native of Bradford, Essex County,

Massachusetts, named Nathaniel Savory, with four other white men and twenty-five Kanakas including some women, sailed from Honolulu, being furthered in their adventure in every way by the British consul, at that time Mr. Richard Charlton. On June 26, 1830, they reached the Bonin Islands and hoisted an English flag which had been given them by Mr. Charlton. In 1842 one Mazarro received the official title of governor from the Acting British Consul for the Sandwich Islands, Alexander Simpson. A vessel from the British China Squadron visited the Islands, and whaling ships frequently put in for supplies of fresh water and vegetables. In 1848 Mazarro died and his widow became the wife of Nathaniel Savory, who finally succeeded to the headship of the Islands and seems to have been a wise and sensible man. In 1851 the English war-ship "Enterprise," under Captain Collinson, visited the Islands and found four of the original white settlers still in possession. On June 14, 1853, Commodore Perry with the American war-ships "Susquehanna" and "Saratoga" anchored at Port Lloyd. He purchased a piece of property there, made Nathaniel Savory his agent, drew up a code of rules which the islanders adopted on August 28, 1853, when Nathaniel Savory was made Chief Magistrate. In October of the same year Commodore Perry dispatched Captain Kelley in the ship "Plymouth" with instructions to survey and take formal possession of the southern group (Bailey Islands) in the name of the United States and to rename them Coffin Islands after their first discoverer, Captain Coffin. This was carried out. A full account of Commodore Perry's visit is recorded in *The Official Report of United States Japanese Expedition* by Commodore M. C. Perry, Vol. I. pp. 196–213 and pp. 282–285.

The next visit of men-of-war after the "Plymouth" was that of four Russian ships which came to Port Lloyd in 1854. This was followed by that of the United States Frigate "Macedonian" by which Commodore Perry sent implements of husbandry and seeds. In a letter he writes "it must be understood that the sovereignty of the Bonin Islands has not yet been settled, the interest taken by me in the welfare and prosperity of the settlement has solely in view the advantage of commerce generally."

In 1855 the United States man-of-war "Vincennes" visited Port Lloyd and remained ten days. In 1861 an attempt to colonize Peel Island was made by Japanese. This failed miserably, and the commissioner and last batch of colonists withdrew to Japan early in 1863 some fifteen months after they cast their lot upon the Islands. In 1874 the United States man-of-war "Tuscarora," while engaged on her line of soundings, visited Port Lloyd. On November 24, 1875, a Japanese steamer the "Meiju Maru" entered the port, formally annexed the Islands and since then Japan has been accepted as the rightful sovereign lord of the Bonin Islands. Two days after the arrival of the Japanese "Meiju Maru" the English war-ship "Curlew" also reached the Bonins with Mr. Russell Robertson, British Consul at Yokohama on board. Subsequently, on March 15, 1876, Mr. Robertson gave an excellent account of the Bonin Islands before the Asiatic Society of Japan, which is published in that Society's *Transactions*, Vol. IV. (1876).

Nathaniel Savory died in 1874 and remained nominal head of the Bonin Islanders until the day of his death. He left behind considerable correspondence which ultimately was placed by his descendants in the hands of Reverend Lionel B. Cholmondeley of St. Andrew's Mission, Tokyo, who incorporated it in a book entitled *History of the Bonin Islands*, which he published in 1915. From this work it appears that during the period of Savory's life many whaling ships touched at the Islands. One or two piratical raids were made on them by ships from China commanded by white men. Also that the colony was augmented by men from whalers and from the island of Guam. On the whole the settlers appear to have lived together harmoniously and for this undoubtedly thanks are due to the wise counsel of Nathaniel Savory. After the Japanese annexations this mixed race of white and Kanaka became Japanese subjects. To-day whaling ships are there no more; Japanese have settled there in numbers, all available land is under crops, chiefly sugar; the seas have been denuded of their swarms of turtles and fish and altogether the struggle for existence made as hard as in Japan proper. Some sixty or seventy English-speaking descendants of the Bonin Islanders remain. A church, under the auspices of the St. Andrew's Mission, has been built and one of the Bonin Islanders, the Reverend Joseph Gonzales, is pastor. The younger generation of adults have taken Japanese wives and in a few years virtually all traces of this interesting colony will have disappeared.

The Bonin Islands lie right within the warm Japan stream (Kuro-suwo) and this accounts for the fact that the mean temperature is higher than that of Hongkong which is five degrees farther south. As proof of this the Cocoanut ripens its fruit in Bonin but does not in Hongkong. The winters are warmer and the summer less hot than in Formosa and Hongkong. The rainfall, according to the reports of the Central Meteorological Observatory of Japan, averages about 1550 mm. only, which is less than that of Tokyo in Japan. From the statistical tables available there does not appear to be any marked wet or dry season. December, January, March, April, May, June, July and August appear to be the wettest months. My visit was in the latter part of April and early May and we enjoyed fair weather the whole time. Windstorms and thunderstorms are frequent and arise and fall very quickly.

It is a region of old submarine volcanoes and the islands are of this origin. They are considered to have been ejected from the ocean's bed in Eocene times. Geologically they are all alike, consisting of a kind of andesitic lava, called Boninite, and sedimentary agglomerate tufaceous rocks. Limestone from solvent corals is found on the tops of several of the higher peaks — Sekimonzan in particular — where it is weathered into sharp edges which cut one's boots and hands if touched. The surface soil is mainly the reddish clay (laterite) generally so common in tropical regions. Fossil shells (Nummulites) are common, especially in Haha-jima. The coastline is steep and much indented by sea erosion and caves, some of them extensive as on Mukō-jima, are common. The four tiny harbors are due to sinkage

and erosion. Many of the islands have been eroded almost to sea-level and are barren of vegetation or nearly so. At the southern end of Haha-jima, there is a little marshy land but I saw none elsewhere. A few leagues to the south are the Sulphur Islands, a tiny group of volcanic islets of more recent origin than the Bonins, but as I did not visit there no further reference to them will be made.

Leaving Yokohama on the morning of April 18, 1917, we touched at Hachijo and Tori-shima Islands and reached Chichi-jima in the forenoon of April 21. Hachijo is an interesting volcanic island belonging to the Idzu group, and was in old days used as a penal settlement for political offenders. Tori-shima, or Bird Island, is an active volcano over 650 meters high; and bare save for *Vitex ovata* Thunb. and a few herbs at sea-level. It is a breeding place for two species of Albatross (*Diomedea immutabilis* Roths. and *D. albatrus* Pall.) and these birds are so tame that they may be caught by hand. Formerly a Japanese was engaged in the reprehensible trade of exporting feathers and had fully a hundred people engaged on this island killing the birds. The volcano erupted, about ten years ago, killed nearly every inhabitant, and scared the birds from this haunt. The birds are now returning and some five or six people live on the island where landing, except in the calmest weather, is out of the question. The temperature of the water at the landing place is nearly 100° F. On the outward journey we managed to land for a short time but found it impossible to do so on our return.

Seen from the sea, the central and southern groups of the Bonin Islands are extremely picturesque with irregular, bold, black, wall-like cliffs worn into rude shapes. The strong winds which prevail keep the vegetation, in all but the sheltered parts, down to a mean height and from the sea there are no apparent outstanding features of forest-growth. A dense thicket where no cultivation exists is the impression given. As the harbor in Chichi-jima is reached a Palm (*Livistona chinensis* R. Br.) is seen to be especially abundant, and its mop-like crown of gray-green fan-shaped leaves, with their long pendent edges, is reared well above the other vegetation. In gullies, and indeed in every place affording some shelter, grows a variety of trees and shrubs and chief among them is a Cabbage Palm (*Cyphokentia Savoryana* Rehd. & Wils.) which in the past made the Islands famous among whaling and other sea-faring men. This Palm is not abundant today but is in no danger of extermination. On the beaches grow such wide-spread, maritime plants as *Vitex ovata* Thunb., *Scaevola Koenigii* Vahl, *Ipomaea biloba* L., *Canavalia obtusifolia* DC. *Caesalpinia Bonducella* Flem., *Hernandia peltata* Meisn., *Calophyllum Inophyllum* L., *Hibiscus tiliaceus* L., and *Erythrina indica* L., all typical of the tropics. From sea-level to high on the mountain slopes a Screw Pine (*Pandanus boninensis* Warb.) is abundant and is perhaps the most common plant on the islands. Where the vegetation has been undisturbed on the hills, and more especially in places protected from the strong winds, trees grow thickly and on their trunks are epiphytes in profusion. Among these epiphytes are such Orchids as *Cirrhope-*

talum boninense Schlecht. and *Luisia boneninsis* Schlecht., and Cryptogams like *Psilotum triquetrum* Sw. *Lycopodium cernuum* L., *Asplenium nidus* f. *intermedia* Mett., *Vittaria boninensis* Chr. and several species of Trichomanes, Polypodium and other Ferns. Three species of Tree Ferns with *Angiopteris evecta* Hoffm. and the scandent *Freycinetia formosana* Hemsl. are prominent features of the vegetation. The undergrowth in the forests is mainly of *Ardisia Sieboldii* Miq., *Rapanea Maximowiczii* Koidz., *Sambucus javanica* Bl. and Ferns, especially Aspidiums. In more open places *Alpinia boninsimensis* Mak. and *Crinum asiaticum* L. abound. But interesting and varied as the vegetation of the Bonins now is they can no longer be described as clothed with luxuriant vegetation from the water's edge to the tops of the highest peaks as they were when visited by the English and Russian ships in 1827 and 1828. In quite recent years Sugar-cane has been introduced and almost all the land suitable for its culture has been cleared by fire and axe and planted. Windbreaks have been found necessary to protect the sugar-cane and for this purpose *Pandanus boninensis* Warb. *Livistona chinensis* R. Br., *Calophyllum Inophyllum* L. and *Boninia glabra* Planch. are much used. On the south end of Haha-jima, an undulating and rather marshy promontory clothed with scrub and coarse grasses, *Casuarina equisetifolia* Forst. imported from Hawaii has been planted and promises to be a success. An attempt to grow *Ficus elastica* Roxb. for rubber has ended in failure, the tree being unable to withstand the wind. A few Cocoanut-trees are grown, the Papaya is common in gardens, also a number of vegetables and ornamental plants, but the only agricultural industry that amounts to anything is sugar-growing.

I spent two weeks on the Islands, visiting Chichi-jima and Ani-jima, the larger islands of the central, and Haha-jima and Mukō-jima the principal ones of the southern group. The other islands have very little vegetation and I had not the time to visit them. The currents are very strong and sailing from island to island in the small boats available is dangerous. Thanks to the courtesy of the Department of Agriculture, Tokyo, every arrangement was made for me to see as much as possible in the time at my disposal. The forestry officer of the Islands, Mr. Hidemasa Otomo, whose knowledge of localities where special plants grow is remarkable, accompanied me everywhere and through his services I saw, with one or two exceptions, every woody plant known to grow on the Bonins. Of those I did not see Mr. Otomo furnished me with specimens from the Government Museum. The trip to and from was unpleasant owing to the poor accommodation on the ship and to the choppy seas, but the stay on the Islands was delightful. My main object was to see and collect *Juniperus taxifolia* Hook. & Arn. and whatever else I could in the time at my disposal. The result so far exceeded expectations that it warrants the publication of this short account of the whole ligneous vegetation.

The first account of the flora of the Bonin Islands is that of Hooker & Arnott in their *Botany of Captain Beechey's Voyage*, pp. 258 to 274 where 42 plants are recorded from Bonin, 23 of them being woody. Figures of two

new trees (*Sideroxylon ferrugineum* Hook. & Arn., *Elaeocarpus photiniaefolius* Hook. & Arn.) and of an Evonymus, now considered a new species (*E. boninensis* Koidz.), are given. This collection was the only one of importance made so far as I can discover until the Japanese began to take a serious interest in botany. Some plants were collected on the Commodore Perry Expedition, for Gray in his *Botany of Japan* (388) says, "Mr. Wright found the Californian *Photinia arbutifolia* at the Bonin Islands along with the Osteomeles of the Sandwich Islands. On page 398 Gray describes a new Composite as *Ixeris? Ixeridium linguaefolia* and says it was collected by Wright in the Bonins. Maximowicz afterwards referred this plant to the genus Crepis. Decaisne described the Photinia mentioned by Gray as a new species, under the name of *Photinia Maximowiczii*. In the *Ann. Sci. Nat.* sér. 5, XIV. 309 (1872) Planchon describes an endemic Rutaceous genus Boninia with two species and mentions a specimen in Herb. Acad. Petrop. and another in Herb. Hook., no. 56. It would appear that it was collected by the Russians and possibly by Beechey. It is evident that men of the ships which visited the Bonin Islands after Captain Beechey made collections of plants but they do not appear to have been systematically described.

In the *Journal of the College of Science, Tokyo*, XXIII, art. 10 (1908) is a phytogeographical article by H. Hattori on a very elaborate plan but its usefulness is curtailed by the author enumerating every name given to Bonin plants irrespective of their correct application. He enumerates 70 families comprising 164 genera and 220 species as growing on the Bonin Islands. Of these 54 species are Cryptogams and 74 phanerogamous herbs. Of the 92 woody plants 34 are now known to belong to other species and eight are suffruticose, roadside weeds wide spread in the tropics. He regards 11 species of woody plants as endemic. One family Hattori includes (*Capparidaceae*) must be eliminated, for the plant he refers to here (*Coronopus didymus* Smith) belongs to the Cruciferae. His "Gardenia radicans" is *G. augusta* Merr. and his "Zanthoxylum piperitum" is the same as *Z. Arnottianum* Maxim. both of which he includes.

In the last few years the Japanese botanists and especially Messrs. Makino, Nakai and Koidzumi, have described many new species from the Bonin Islands. Today the ligneous flora excluding those for ornamental or æsthetic purposes introduced by man is known to belong to 57 families comprising 100 genera and 107 species and 5 varieties. Of these six are now described for the first time in this Journal. These woody plants are divisible into 43 trees, 54 shrubs and 15 climbers. Of these one genus and fifty-four species and four varieties are endemic, thirty species are widely spread in the tropics, and seventeen species grow also in south Japan, Liukiu, Formosa and southern China. Considering the proximity to southern Japan and Liukiu the number of species common to these areas and to the Bonins is remarkably small. The Bonin Islands are really very isolated and being entirely erupted from the ocean their origin sufficiently explains the high percentage of endemic plants; nevertheless, the flora is in all its essential characters an outpost of the Chino-Malayan floras and is not

Polynesian. The Cocoanut has, of course, drifted to the Bonins in the ocean currents, but it is quite a rare tree though now its planting is being sparingly undertaken. The Hernandia doubtless came in the same way for its fruits with their pink bladder-like vesicle are specially adapted for such distribution; also the Calophyllum and Terminalia. Migratory wild fowl doubtless brought others either in their crops, on their feet or among their feathers. But apart from a coastal fringe of wide-spread tropical and subtropical plants the flora is mainly endemic. Prior to its general clearance for sugar-cane it must have been densely covered with ligneous growth. The windstorms must always have kept this growth comparatively low and even, except in sheltered places, just as it occurs today.

Though the Islands are small and the area of the three groups inconsiderable there is some marked dissimilarities in their ligneous growth. For example Morus grows only on Haha-jima, the Juniper grows on Chichi-jima and Ani-jima and Mukō-jima but not on Haha-jima. On Mukō-jima no Tree Fern, Freycinetia nor Viburnum grows. On Haha-jima Juniperus, Distylium, Osteomeles and Viburnum do not grow, otherwise this island supports probably the richest flora of the whole group, certainly on it grow the largest trees. From the whole group Bamboos, Mangroves, Tree Figs (such as *Ficus retusa* L., *Ficus Wightiana* Wall.), the climbing *Ficus pumila* L., *Myrica rubra* S. & Z., *Garcinia spicata* Hook. and *Bischofia javanica* Bl. are absent though they might reasonably be expected to occur. The presence of a shrubby Lobelia is interesting since no other species of this section grows in eastern Asia. The absence of any species of Rhododendron makes this group unique among the islands of eastern Asia. The presence of a shrubby Statice is also a noteworthy feature whilst the absence of the wide-spread *Pandanus tectorius* Soland. and the presence of such a well-marked endemic species as *Pandanus boninensis* Warb. is most surprising. The maritime *Tournefortia argentea* Linn. f. is rare, but *Cassytha filiformis* L., *Ipomaea biloba* L. and *Scaevola Koenigii* Vahl, its companions on Liukiu, are abundant. The *Freycinetia formosana* Hemsl. abounds, forming dense jungle on the upper slopes of the highest peak (Chibusa-yama) on Haha-jima, and in the forests scaling the highest trees. The only other place it grows outside of the Bonins is in the extreme north of Formosa which is the type locality, where it is both local and rare.

The herbs which grow on the Bonins are not noteworthy: among the Monocotyledons some of the Orchids, and Scitamineous plants are pretty and *Crinum asiaticum* L. is handsome, but the Dicotyledonous herbs are mostly wide-spread roadside weeds and weeds of cultivation. The Ferns are lovely, their variety considerable and their number multitudinous. I could not spare the time to collect them, to my lasting regret. The three Tree Ferns are *Cyathea spinulosa* Wall., *Alsophila latebrosa* Hook., and *A. Bongardiana* Mett., and certainly they are as handsome as any of their family. Trees from 8 to 10 m. tall crowned with tabular heads of wide-spreading green fronds and likewise the old type *Angiopteris evecta* Hoffm. are abundant. Also the striking Birdsnest-Fern (*Asplenium nidus* var. *inter-*

media Mett.), a spreading, vase-shaped plant with a rosette of bright green leaves a meter long abounds on the limestone and on trees, but nowhere more so than on Sekimonzan. On this mountain I did collect the endemic Hounds-tongue (*Scolopendrium Ikenoi* Makino) with its 7 cm. long, cordate-acuminate, delicate fronds. It is outside the province of this paper to enter further into details regarding the Ferns, but since they are the dominant undergrowth in the forests and everywhere abundant, they are a most important feature of the flora of the Bonin Islands.

CLIMBERS

Freycinetia formosana Hemsl.	Colubrina asiatica Brongn.
Smilax china L.	Cissus japonica Willd.
Piper futokadsura Sieb.	Elaeagnus rotundata Nakai
Clematis boninensis Hay.	Trachelospermum divaricatum Kanitz
Cassytha filiformis L.	Ipomaea biloba L.
Canavalia obtusifolia DC.	Argyreia tiliaefolia Wight
Mucuna gigantea DC.	Psychotria serpens var. macrophylla Koidz.
Vigna retusa A. Gray	

There are fifteen climbers as shown above and they belong to 12 families and fifteen genera. Of the two Monocotyledonous species the Smilax is a common plant, on the larger islands at least, and calls for no special remark. The Freycinetia on the other hand ranks with the Clematis, the Elaeagnus and the Trachelospermum as one of the four principal climbers of the Islands. As before mentioned it forms dense impenetrable thickets on the upper mountain slopes and in the forest scales the highest trees. The stems put out roots which cling to the moist tree-trunks and rocks. The dark green, spirally arranged leaves are smooth on the margin and flaccid, and the finger-like fruit, in a cluster of three, is red and soft and disappears soon after it is ripe in August. When in Formosa I closely examined the species in the type locality and could find no difference between it and the Bonin plant. The Piper is a wide-spread species in south Japan, Liukiu, and Formosa and in the Bonins it is common on trees and rocks. Its orange-yellow spicate flowers are quite attractive. The Clematis is allied to the Japanese *C. paniculata* Thunb. and is common in thickets and on the margins of forests where it can enjoy the sunlight. The Cassytha is not common and, curiously enough, grows on the grassy hilltops and not on the seashore, its normal habitat in Liukiu, Formosa and the other places where I have met with it. Of the three Leguminous genera the Mucuna is rare and is confined to shady forests and thickets. The Canavalia and Vigna are scarcely woody and abound in open grassy places near the sea, and if the site is brackish and swampy so much the better; both are cosmopolitan in the tropics. The Mucuna is also widely spread, though there is a possibility of the Bonin plant with its pink flowers being a distinct but critical species. The Colubrina, which in growth and appearance strongly suggests Celastrus, I saw on Haha-jima in one place only and it is evidently rare. The Cissus I did not see and I am indebted to Mr. Otomo for a specimen; it is certainly

strange that a plant so abundant from Japan to Formosa and through China should be so rare in the Bonins. The Elaeagnus is perhaps the largest of the Bonin climbers and finds its way to the tops of the tallest trees, from which its rope-like stems hang down. It is near *Elaeagnus macrophylla* Thunb. and is an autumn-flowering species. I could find neither flower nor fruit. The Trachelospermum has relatively large, inodorous flowers, and in late April and May is singularly attractive and conspicuous on rocks, tree-trunks and shrubs in sunny places. On the seashore the cosmopolitan *Ipomaea biloba* L. is common with its string-like stems firmly anchored at and above tide-mark. The climbing *Argyreia tiliaefolia* Wight grows only near habitations and was undoubtedly introduced from Hawaii. Lastly the Psychotria with its leaves much broader than that of the wide-spread type, grows on rocks and tree-trunks in the forests although it cannot be described as common.

SHRUBS

Piper Postelsianum Maxim.
Boehmeria boninensis Nakai
Procris laevigata Bl.
Pseudixus japonicus Hay.
Bryophyllum calycinum Salisb.
Pittosporum boninensis Koidz.
Osteomeles anthyllidifolia Lindl.
Rubus Nishimuranus Koidz.
Caesalpinia bonducella Flem.
Lespedeza striata Hook. & Arn.
Leucaena glauca Benth.
Mimosa pudica L.
Rhynchosia minima DC.
Evodia Kumagaiana Rehd. & Wils.
Zanthoxylum Arnottianum Maxim.
Phyllanthus Niruri L.
Ilex Matanoana Mak.
Ilex Mertensii Maxim.
Evonymus boninensis Koidz.
Dodonaea viscosa Jacq.
Triumfetta subpalmata Soland.
Malvastrum tricuspidatum A. Gray
Sida rhombifolia L.
Eurya boninensis Koidz.
Stachyurus macrocarpus Koidz.
Wikstroemia pseudoretusa Koidz.
Eugenia boninensis Koidz.
Eugenia microphylla Abel
Melastoma sp.
Vaccinium bracteatum var. Wrightii Rehd. & Wils.
Statice arbuscula Spr.
Symplocos Otomoi Rehd. & Wils.
Ligustrum japonicum Thunb.
Osmanthus insularis Koidz.
Geniostoma glabra Matsum.
Vinca rosea L.
Asclepias curassivica L.
Tournefortia argentea Linn. f.
Callicarpa glabra Koidz.
Callicarpa Nishimurae Koidz.
Vitex ovata Thunb.
Lycium sp.
Myoporum boninense Koidz.
Gardenia augusta Merr.
Morinda citrifolia L.
Morinda umbellata L.
Oldenlandia cordata Matsum.
Oldenlandia Grayi K. Sch.
Rubiacea
Sambucus javanica Bl.
Viburnum japonicum var. boninsimense Mak.
Lobelia boninensis Koidz.
Scaevola Koenigii Vahl
Cacalia crepidifolia Nakai

The 54 shrubby plants are distributed among 35 families and 50 genera; 24 species and one variety are endemic. The Bryophyllum, Leucaena, Rhynchosia, Mimosa, Lespedeza, Phyllanthus, Triumfetta, Malvastrum, Sida, Vinca and Asclepias are roadside weeds and very probably have been quite recently introduced. I did not collect the Mimosa and Lespedeza.

The Pseudixus is a pest and grows on nearly every kind of shrub and tree. The Piper, Procris, Sambucus, Boehmeria and the two Oldenlandias are not very woody; the first three are common as undergrowth in moist shady places and the two latter prefer more sunny places. The Caesalpinia, Wikstroemia, Statice, Vitex, Lycium, Myoporum, Tournefortia, Lobelia and the Scaevola are littoral plants. The Myoporum I did not see, but it was described from Chichi-jima by Koidzumi in 1918. The Vitex is a useful plant for holding down sand, shingle, and loose earth, and is always found at and near sea-level. The Scaevola, with its fleshy leaves and stiff branches, is one of the most common shrubs on the island from sea-level to a few hundred feet above in open windswept places, and is quite a handsome plant. The Tournefortia is rare and I saw a few plants in two localities only, the Lycium I only saw on Mukō-jima on bare rocks within reach of the sea's spray, but the Lobelia is common in many places but in none more so, however, than in Mukō-jima; it is an interesting extension of the known distribution of the genus. The Statice I did not see growing and it is probably wrongly determined. The Wikstroemia is widely scattered and is quite common. The wide-spread Caesalpinia is not very abundant; the Pittosporum is plentiful and is remarkable for its globose, woody, strongly decurved fruit. I was much interested to find *Osteomeles anthyllidifolia* Lindl. which seems to be identical with the Hawaiian plant. It is absent from Haha-jima but is common on Chichi-jima, Ani-jima and other islands. When growing freely its slender branches arch gracefully and the leaves are only slightly hairy, and from this it varies to a stunted shrub hugging rocky ground with leaves densely covered with a white tomentum. The fruit is said to be as often white as black and is edible, being considered a wild plum by the Bonin Islanders. The two Rutaceous shrubs are uncommon and so is *Ilex Matanoana* Mak., but the other Ilex is very plentiful; its thick, shining green leaves are reddish when young and are variable in size; sometimes it is almost a tree. It is the plant referred to by Hooker & Arnott (*Botany of Beechey's Voyage*, 261). Makino has described (in *Jour. Jap. Bot.* 1. 21 [1917]) an *Ilex bonincola*, but from the description I think this is simply a state of his *Ilex Matanoana* with large leaves such as are found on free-growing shoots. The Evonymus is rather rare, at least on Haha-jima where I collected it. It is well figured by Hooker & Arnott (l. c. 54, 261) who erroneously referred it to *Evonymus japonicus* Thunb. The Dodonaea and Eurya are common and call for no special remark, but the Stachyurus is rare and though similar to the Japanese species in habit and flowers has a remarkably large, rounded fruit. It is a very distinct and interesting addition to the genus. The *Eugenia boninensis* Koidz. I did not see, but the other species is a common shrub, from 0.6 to 2 m. tall with edible fruit, and is often stoloniferous in habit. It is a feature of the rather bare hilltops of Ani-jima. The Melastoma I did not see and the Vaccinium only on Ani-jima where it is a bush from 2 to 3 m. high. The Symplocos I did not see growing, the specimen being given to me by Mr. Otomo. The Ligustrum is very plentiful and differs in no way from speci-

mens collected in Japan and Liukiu. The Osmanthus is abundant and is often 6 m. high. It seems to be closely related to the Liukiu *Osmanthus bracteatus* Matsum. The two Callicarpas are fairly common shrubs in the more open country; in *Callicarpa glabra* Koidz. the undersurface of the leaves often glistens with lepidote glands. The wide-spread *Gardenia augusta* Merr. (better known as *Gardenia florida* L.) is one of the most common shrubs and grows quite tall. The Rubiaceous shrubs not already mentioned are common undergrowth in forests and shady places. The Viburnum has handsome foliage and flowers but seems to be confined to the Chichi-jima group. The Cacalia is not common and is a bush from 2 to 3 m. high, much branched, with gray, corky bark and grows on the margins of woods. Nakai describes another species *C. ameristophylla*, but this is probably only a condition of the *C. crepidifolia*.

TREES

Juniperus taxifolia Hook. & Arn.
Pandanus boninensis Warb.
Cocos nucifera L.
Livistona chinensis R. Br.
Cyphokentia Savoryana Rehd. & Wils.
Celtis boninensis Koidz.
Trema argentea Bl.
Ficus boninsimae Koidz.
Ficus Iidaiana Rehd. & Wils.
Ficus Nishimurae Koidz.
Morus boninensis Koidz.
Calpidia Nishimurae Rehd. & Wils.
Cinnamomum scrobiculatum Nakai
Machilus boninensis Koidz.
Machilus kobu Maxim.
Machilus pseudokobu Koidz.
Neolitsea gilva Koidz.
Neolitsea boninensis Koidz.
Hernandia peltata Meisn.
Distylium lepidotum Nakai
Photinia Maximowiczii Decne.
Raphiolepis integerrima Hook. & Arn.
Erythrina indica Lam.
Boninia glabra Planch.
Zanthoxylum ailanthoides var. inerme Rehd. & Wils.
Claoxylum centenarium Koidz.
Putranjiva integerrima Koidz.
Melia Azedarach L.
Sapindus mukorossi Gaertn.
Elaeocarpus photiniaefolius Hook. & Arn.
Hibiscus tiliaceus L.
Hibiscus tiliaceus var. glabra Matsum.
Schima boninensis Nakai
Calophyllum Inophyllum L.
Terminalia catappa L.
Eugenia oxygona Koidz.
Fatsia oligocarpella Koidz.
Ardisia Sieboldii Miq.
Rapanea Maximowiczii Koidz.
Sapotacea?
Sideroxylon ferrugineum Hook. & Arn.
Symplocos boninensis Rehd. & Wils.
Paralstonia clusiacea Baill.

We now come to the most interesting group, namely, the trees of which there are 41 species and two varieties belonging to 37 genera and 27 families. Of these 26 species and two varieties are endemic. The solitary Gymnosperm *Juniperus taxifolia* Hook. & Arn. is one of the most interesting of the Bonin trees and the one my visit was principally concerned with. It grows on Mukō-jima, Chichi-jima and Ani-jima and is today most plentiful on the last. In the sheltered gullies growing with Palms and Tree Ferns it is a tree 15 meters tall with a trunk 1.3 meters in girth and ascending-spreading branches and long, slender branchlets hanging straight down. Such trees are as ornamental and beautiful as any Juniper can be. On windswept areas it is a low mat-like shrub hugging the ground closely, with gnarled

and twisted branches and between these extremes there is every conceivable condition, but the tree form is rare. The leaves are bright green and not pungent, and the fruit is shining chestnut brown and glaucous along the edges of the confluent scales. Formerly it was a common tree and was called "Spruce" by the original Bonin Islanders and used by them for posts in their houses and for fuel. It is peculiar to these Islands but in books the, Liukiu Juniper, which is nothing but the wide-spread littoral *J. conferta* Parl., and the Formosan and Chinese *J. formosana* Hay, have been confused with it. It had not been introduced to cultivation until I sent to the Arnold Arboretum seeds gathered on my visit.

Of the four Monocotyledonous trees three of them together form the dominant features of the whole arborescent flora of the Bonins. The Screw Pine (*Pandanus boninensis* Warb.) is a handsome species often 8 meters tall with many rope-like aerial roots and a dichotomously much-branched crown of dull green leaves. On young plants the leaves are clear green. The fruit is orange-colored, as large as a man's head and very heavy; the seeds are edible and are much sought after by the Fruit-bat (*Pteropus pselaphon* Andersen), the only mammal indigenous to the Islands. The Pandanus is common from sea-level to mountain tops but is a light-demanding tree and does not thrive in the dense forest shade. It is probably the most common tree on the Islands and is much used as a windbreak with the Fan Palm (*Livistona chinensis* R. Br.) and *Calophyllum Inophyllum* L. around sugar-cane plantations.

The Cocoanut has been sparingly planted by Japanese but it also occurs as a strand tree although it is rare. Planted in front of the cottage of the Rev. J. Gonzales at Omura, Chichi-jima, is a fruiting Cocoanut-tree grown from a nut picked up on the beach and planted by him a number of years ago. The other two Palms are abundant, and it was the Cyphokentia together with fresh water that made the Islands famous in the days of whaling ships. It is the Cabbage Palm mentioned in all the accounts of the Islands. As a vegetable it is the core of the stems of young trees say 2 meters tall and not more than 20 centimeters in girth, that is esteemed and which I tried and found delicious, but this means the destruction of the plants. In spite of this annihilation carried on for nearly a century this Palm is still plentiful in gullies on the sparsely populated Mukō-jima and Ani-jima. It is not uncommon on Chichi-jima but comparatively scarce on Haha-jima, the two large islands. It is a slender tree from 10 to 15 meters tall, crowned with a tuft of pinnate, arching, dark green leaves. It is the "Areca oleracea" of Captain Beechey and has been wrongly referred by botanists to *Ptychosperma elegans* Bl. which is an Australian Palm. The Fan Palm is *Livistona chinensis* R. Br. which I have also seen growing wild on Aharen Island of the Liukiu group, and by Japanese botanists is considered to be indigenous in parts of south Japan. The oval, bluish green fruit is a favorite food of pigeons, and thus might easily be carried long distances when the birds are blown out to sea by storms. It is a sturdy tree often 16 meters tall, rearing itself above its companion plants and topped by a mop-like head of large,

gray-green, fan-shaped leaves, pendent at the edges. It is unlike other trees on the Islands, and being common is a decided feature. Behind the town of Omura there is a preserved forest and here this Palm is abundant. Also it is plentiful on Mukō-jima and Ani-jima and is also used as a windbreak as already mentioned. On young plants the petioles are armed with strong, curved prickles, but this armature disappears as the adult condition is reached. Although its leaves get sadly tattered the tree is seldom blown down by the windstorms, fierce though they are. Five (*Hernandia peltata* Meisn., *Erythrina indica* L., *Hibiscus tiliaceous* L., *Calophyllum Inophyllum* L., *Terminalia catappa* L.) of the Dicotyledonous trees are strand trees widespread in the tropics. The Terminalia with its tiers of branches spreading at right angles to the trunk and the Hibiscus are not common, but a smooth-leaved form of the latter (var. *glabra* Matsum.) is abundant on the mountains where in the forests it is often 3 meters in girth of trunk and 15 meters tall. The wood of both is used to make the struts to which the outrigger is attached on canoes. The Erythrina and Hernandia are ugly trees when bare of leaves and have many warty excrescences on the trunks. The fruit of the Hernandia is remarkably adapted for distribution by ocean currents as previously told, and the wood is soft and is used in the hulls of canoes. The Calophyllum is the handsomest of these strand trees and decidedly useful both as a windbreak and for its wood, which is beautifully figured. Formerly whaling ships traded in it considerably, and under the name of "Tremona" it was much used and valued by the Bonin Islanders. Around the more sheltered coves at sea-level it grows 25 m. tall and has a trunk 3 m. in girth and a shapely umbrageous crown and dark green leaves. Its globular, plum-like fruit contains a very hard seed which will germinate after long immersion in sea-water.

The Celtis ranks among the finest of the genus. In the bit of virgin forest on Kuwanoki-yama (Mulberry Mt.), Haha-jima, and similar other places it is often 25 m. tall with a trunk 5 m. in girth above the large buttressed roots. The bark is smooth, pale gray, and the fruit orange-colored, the size of a large pea and edible; the green shoots and leaves are used as cattle feed.

The Trema and the three Figs are small trees endemic and unimportant, but the Mulberry or "Kuwa" of the Japanese is the most valuable timber tree on the Islands. The largest living tree I saw grows with the Celtis and was about 23 meters tall and 3 meters in girth of trunk, but a fallen, dead tree I measured was 9 meters in girth of trunk. The wood is yellowish when first cut and changes to nearly black with age. It is finely figured, heavier than water, and is especially valuable for cabinet work though difficult to handle. This Mulberry is an upstanding tree with a straight trunk, clean of branches for 6 or 7 meters, has dark brown, scaly, fissured bark which flakes off, and large, dark green cordate leaves. The flowers appear in October and the fruit is ripe in December. The value of its wood has almost brought about the tree's extinction, in fact it has done so on Chichi-jima, but the Japanese Government is now planting it, and felling it is prohibited.

The Calpidia, or Pisonia as it was formerly called, is in bulk the biggest tree now on the Bonins being often 8 meters in girth of trunk and from 20 to 25 m. tall. The bark is smooth, gray and the branches massive and well clothed with large dark green leaves, but the wood, although fibrous, is brittle, soft and absolutely useless. It is everywhere common but the largest trees are found only on Sekimonzan in Haha-jima.

With six species, all endemic, Lauraceae is the family richest in trees but they are all of small size and, except the Cinnamomum, of no particular value. The Cinnamomum was called by the Bonin Islanders "Sassafras," and among the published correspondence of Nathaniel Savory are many references to this tree, especially from his acquaintances down on the island of Guam who often ask for "Sassafras bark and seed." Another name for it was "Tea Tree" and its wood was used for making hulls of canoes. I am a little sceptical about Koidzumi's *Machilus pseudokobu* being distinct from Maximowicz's species, but my material is insufficient. My visit was not a seasonable one for Lauraceae, as fruiting material is so necessary for determination in this family.

The Distylium is more often a bush than a tree and the same is true of the Photinia and Raphiolepis. The last named furnished the wood for making tool-handles, being both tough and strong and not too heavy. It was first known as "Axe-handle-wood" and then as illiteracy became more general it became "Areki-san-doru" and finally "Sandal-wood," and as such is mentioned by Robertson. This small tree is common everywhere and its bloomy black, globose fruit in upright clusters are most handsome. I prefer to keep it as a species under Hooker & Arnott's name than to refer it as a variety to the variable Japanese *R. umbellata* Makino, more generally known under Siebold and Zuccarini's name of *R. japonica*.

The Boninia as the sole endemic genus is interesting. More often a large bush than a tree, yet it is sometimes 10 meters tall with a trunk 0.6 m. in girth, clothed with smooth gray bark; the leaves are persistent, variable in size, usually shining, but often dull, green. It is dioecious and the small white flowers are borne in axillary cymose clusters; the fruit is capsular. It is everywhere abundant and is often used as a hedge plant. Planchon (in *Ann. Sci. Nat.* sér. 5, XIV. 310 [1872], founded the genus on material from Herb. Acad. Petrop. and in Herb. Hook. no. 56, and distinguishes two species (*Boninia grisea* and *Boninia glabra*) on trivial characters. Koidzumi (in *Tokyo Bot. Mag.* XXXI. 260 [1917]) reduces them to one species (*B. glabra*) and rightly so, I think, though he is in error in citing them as nomina nuda. The other Rutaceous tree here described as a new variety of *Zanthoxylum ailanthoides* Sieb. & Zucc. was known to the Bonin Islanders by the sinister name of "Poison Tree." It is very common, but the only large trees I saw grew on Mulberry Mt. and were 20 meters tall and from 2 to 2.5 meters in girth of trunk. The bark is smooth, pale gray, and the pinnate leaves are 0.3 meters long. It has not the prickles found on the Japanese type with which it has been confused.

The Claoxylum is a recently described species and is a slender tree con-

fined to the forest shade. The Putranjiva is the "White Iron-wood" of the Bonin Islanders and it is in request for general building purposes. It is a common tree from 15 to 20 meters tall and from 1.5 to 2.5 meters in girth of trunk and has gray bark. It was a surprise to me to find the Pride of India (*Melia Azedarach* L.) luxuriating in the depth of the forest on Mulberry Mt. and elsewhere. Until then I knew it only as a tree delighting in open country or the margins of woods, but since I have seen it in the rich forests of northeastern Formosa. On the Bonins it is a common tree and on the mountain mentioned grow specimens 25 meters tall and 6 meters in girth of trunk. The wood is of excellent quality, beautifully figured and was known to the Bonin Islanders as "Cedar," and by them employed to make the floors of their houses. In its wide distribution this tree has been helped by its seed, which can be carried in the crops of migratory birds and by ocean currents. Also man's fondness for this tree has caused it to be carried to so many distant lands that it is not easy to say just when and where it is indigenous. The Sapindus is another wide-spread tree in the Orient, but on the Bonins I saw none of any size though small trees were plentiful in the forests on Haha-jima.

The Elaeocarpus is endemic (though the Japanese *E. ellipticus* Mak. has been confused with it) and very abundant, growing from 10 to 20 meters tall and from 0.5 to 2.5 meters in girth of trunk. The wood was used by the Bonin Islanders for roofing purposes and the tree known as "Shaddock." The Schima is also peculiar to the Bonins and formerly large trees were abundant, but clearings made for a foolish and foredoomed-to-failure experiment to grow Rubber (*Ficus elastica* Roxb.) resulted in the destruction of many handsome trees. This Schima grows from 20 to 25 meters tall with a trunk from 3 to 4 meters in girth and a round-topped crown of massive branches often 15 to 20 meters through. It goes by the name of "Rose-wood" and the timber is considered valuable by the Japanese.

The *Eugenia oxygona* Koidz. is the "Red Iron-wood" of the Islanders and is a slender tree from 4 to 6 meters tall with brownish scaly bark and is everywhere common. The Fatsia is a small tree common among the under-growth of the forest and like its Japanese relative has handsome foliage.

The two Myrsinaceous trees, Ardisia and Rapanea, form the principal arborescent undergrowth in the forests and are also common in thickets. They are slender trees, seldom more than 8 meters tall; the wood of the Rapanea is reddish and that of the Ardisia white. The latter was known as "White Oak" to the early settlers and by them used in house-building. It is possible that the Bonin Ardisia, which has dark reddish fruit, should be regarded as a variety of the wide-spread type.

The Sideroxylon or "Black Iron-wood" of the Islanders is one of the commonest plants on the Bonins but large trees are now rare. On the windswept hilltops it forms scrub from a foot to a yard high, in less exposed places it is a small to a moderate-sized tree, and on Sekimonzan in a bit of sheltered virgin forest are trees 30 meters tall and 5 meters in girth of trunk with wide-spreading buttressed roots sprawling on the ground like

hundreds of large wriggling snakes. The trunk is deeply furrowed and billowy in outline and is clothed with firm, nearly smooth, gray bark. It is a singular tree, striking in appearance, and the contrast between young leaves covered with a soft rufous pubescence and the shining green of mature leaves is most marked. This tree is also considered to grow in Formosa, but the trees pointed out to me as such appeared to be different. The other Sapotaceous tree if, indeed, it really belongs to his family, may also be a species of Sideroxylon, but I saw only one tree without flowers and fruit. It was small — 6 meters tall and 0.3 m. in girth — and was said to bear yellow, flattened, round, edible fruits. It grows on the upper-middle slopes of Chibusa-yama, Haha-jima.

The Symplocos and Paralstonia are both small trees, the first I found on Mukō-jima only, but the Paralstonia is everywhere plentiful and is the "Yellow-wood" of the Islanders; it is a tree sometimes 10 meters tall by one meter in girth of trunk.

CONCLUSION

The Bonin Islands are too small and too windswept to ever become important in tropical agriculture. Sugar-cane grows well and the high price of sugar during the last few years has caused its extensive planting on the Bonins as elsewhere. When sugar falls in price it is doubtful if its cultivation at a profit can be maintained in such small, out-of-the-way places with the consequent high transport rates. The turtles are now scarce and the waters have been very closely fished. With a decline in its sugar industry following that of its marine products the future of these islands is not particularly bright and in all probability many of the Japanese will leave them. With these thoughts in mind it seems worth while to note down the few trees which have been introduced to the Islands and the favorite garden plants of the early settlers, since as they escape in a century's time future visitors may think them indigenous. The Bonin Islanders do not appear to have introduced many plants economic or otherwise. The Papaya (*Carica Papaya* L.) is common and yields excellent fruit; the Banana, formerly a most important crop, has been attacked by disease and has virtually disappeared from the Islands. The Lemon grows and fruits well and in one garden grows a very large tree of a kind of "Grape fruit." The present owners know nothing of its history but most probably it came from the island of Guam. The Passion fruit (*Passiflora edulis* Sims), a Guava (*Psidium Cattleyanum* Sab.) have also been introduced and so too has *Ficus retusa* var. *nitida* Miq., the common Banyan Fig of Luikiu and Formosa. For ornament in the gardens I noted *Russelia juncea* Zucc., Poinsettia (*Euphorbia pulcherrima* Willd.), Oleander (*Nerium odorum* Soland.) Pomegranate (*Punica Granatum* L.), two Hibiscus (*H. rosa-sinensis* L. and *H. schizopetalus* Hook.) and *Cuphea eminens* Planch. & Lindl. As hedge plants *Lagerstroemia subcostata* Koehne, and a Jasmine (*J. undulatum* var. *elegans* Hemsl.) are common and the latter has escaped. The Japanese have introduced a number of plants and in Omura, Chichi-jima, there is

a small experimental garden, but the above-mentioned plants should be credited to the early white settlers. For forest planting the Japanese have introduced, from Honolulu, I believe, *Casuarina equisetifolia* Forst. and have also planted *Acacia confusa* Merrill, *Pinus luchuensis* Mayr and *Ficus elastica* Roxb. To their temple ground the Japanese priests have introduced *Ficus pumila* L. and *Buxus liukiuensis* Mak.

For native plants which the original white settlers found useful or interesting they most naturally coined names, and these are given in Robertson's paper already mentioned on page 100. To aid in the identity of these I was fortunate enough to enlist the services of the Rev. J. Gonzales who has known the plants by their vernacular names from his childhood. He procured me specimens of all but one or two, and the list of these with their scientific names may fitly conclude this sketch of the ligneous flora of the interesting Bonin Islands.

Axe-handle-wood (Raphiolepis integerrima Hook. & Arn.)
Cedar (Melia Azedarach L.)
Hao-wood, Mountain (Hibiscus tiliaceus var. glabra Matsum.)
Hao-wood, Narrow leaf (Raphiolepis integerrima Hook. & Arn.)
Hao-wood, Soft (Hernandia peltata Meisn.)
Hao-wood, Swamp (Hibiscus tiliaceus L.)
Iron-wood, Black (Sideroxylon ferrugineum Hook. & Arn.)
Iron-wood, Red (Eugenia oxygona Koidz.)
Iron-wood, White (Putranjiva integerrima Koidz.)
Kehop (Crinum asiaticum L.)
Milk-wood (Ficus boninsimae Koidz.)
Mulberry (Morus boninensis Koidz.)
Plum, Wild (Osteomeles anthyllidifolia Lindl.)
Poison-wood (Zanthoxylum ailanthoides var. inerme Rehd. & Wils.)
Rose-wood (Schima boninensis Nakai)
Sage tree, Wild (Vitex ovata Thunb.)
Sassafras (Cinnamomum scrobiculatum Nakai)
Shaddock (Elaeocarpus photiniaefolius Hook. & Arn.)
Spruce (Juniperus taxifolia Hook. & Arn.)
Tea-wood tree (Cinnamomum scrobiculatum Nakai)
Tremona or Tomana-wood tree (Calophyllum Inophyllum L.)
White Oak-wood (Ardisia Sieboldii Miq.)
Yellow-wood (Paralstonia clusiacea Baill.)

NEW WOODY PLANTS FROM THE BONIN ISLANDS

ALFRED REHDER AND E. H. WILSON

Cyphokentia Savoryana, sp. nov. — *Ptychosperma elegans* Hattori in Jour. Coll. Sci. Tokyo, XXIII. art. 10, 22, 44, t. 2, fig. 1[1] (1908), non Blume.

Arbor ad 16 m. alta, trunco annulato laevi, circiter 0.5 circuitu, glabra paleis rufis foliorum erumpentium cito caducis exceptis. Folia paripinnata,

[1] The explanations to plates 2 and 4 have been interchanged.